Arizona State Retirement System

Asset Allocation Study

October 16, 2009

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"Advancing Your Investments"

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Agenda

- ASRS Asset Allocation Study Background
- October 16, 2009 ASRS Board Meeting Objective
- Review Proposed Thematic Changes to Existing ASRS Asset Allocation Policy
- Asset Allocation
  – Comparison of Current Actual Asset Allocation, Current Asset Allocation Policy and Recommended Asset Allocation Policy
  – Recommended ASRS Asset Allocation Policy Schematic (Exhibit A)
  – Pro-Forma ASRS Asset Allocation Policy
  – Asset and Risk Allocation Summary
- Benchmark Definitions
- Appendix

ASRS Asset Allocation Study Background

- Asset allocation discussions have occurred over the past three to four months between Investment Committee Trustees, NEPC and ASRS Investment Staff to understand and develop the proposed changes to the ASRS asset allocation policy.
- These meetings have resulted in a recommendation by the Investment Committee to the full Board their consideration and approval of a new ASRS Asset Allocation Policy Schematic as denoted as Exhibit A on slide 17.

Objectives of October 16, 2009 ASRS Board Meeting

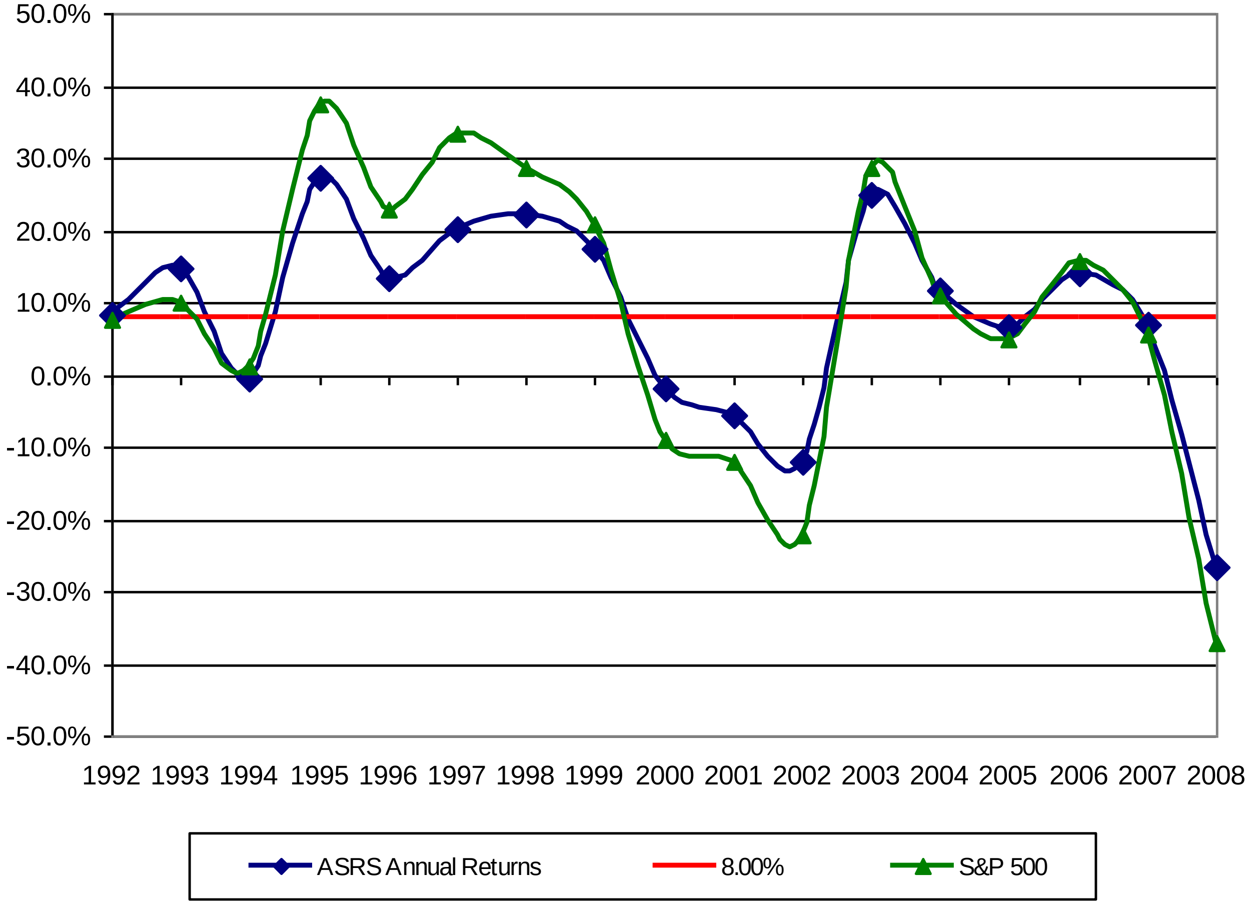
- October 16, 2009
  - Review recommended asset allocation schematic, which was approved by the IC at the October meeting, for final approval.

Proposed Thematic Changes to Existing ASRS Asset Allocation Policy

- Reduce Public Equity Exposure
- Re-structure Non-U.S. Equity Allocation
- Re-Structure Fixed Income Allocation
- Increase Allocation to Private Equity
- Add Allocation to Inflation Linked Assets
- Expand Opportunistic Allocation
- Evaluate Risk Parity Strategies

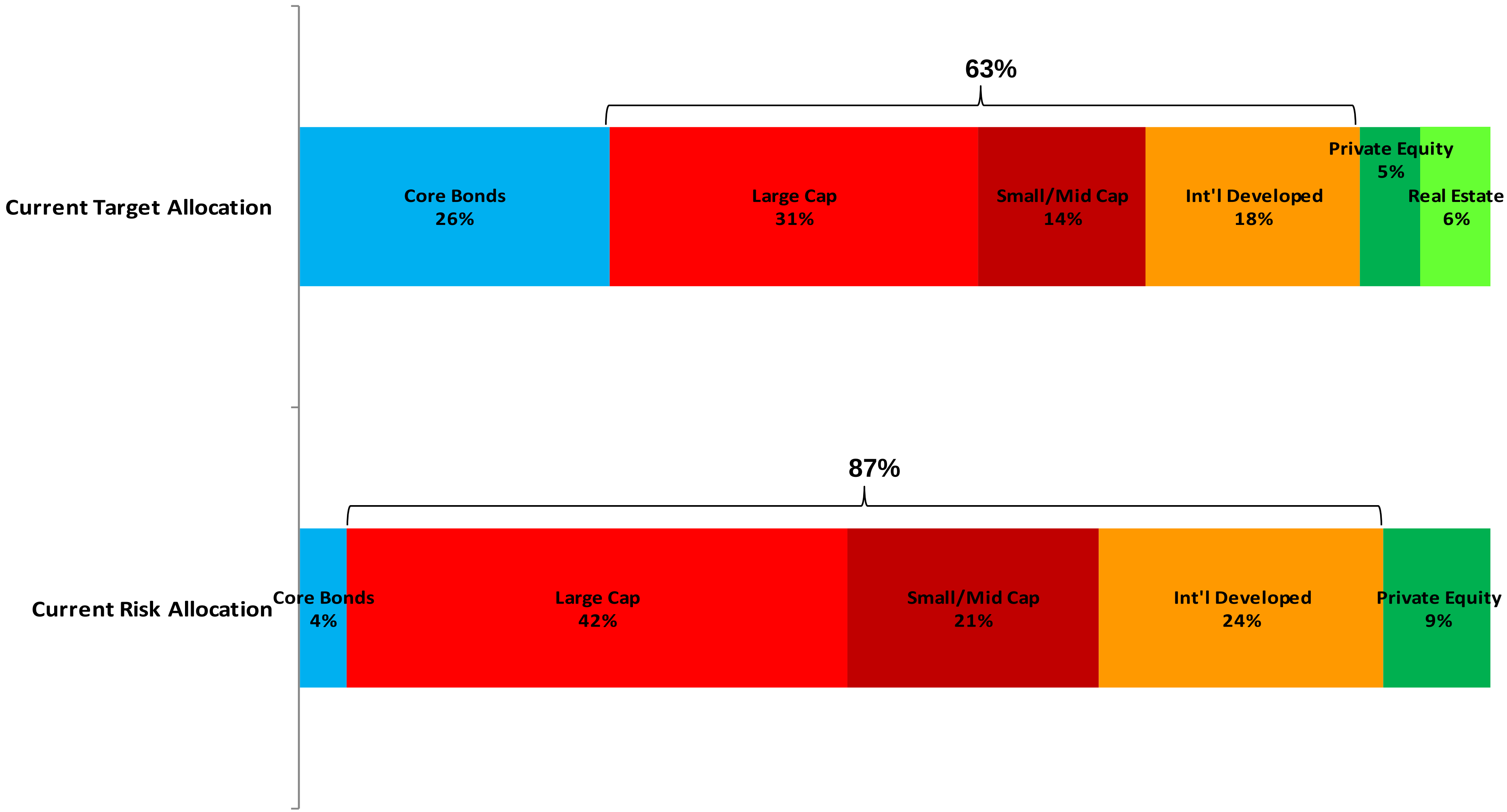
Public Equity Risk

- Despite diversification into multiple asset classes, overall asset returns are still strongly driven by the stock market



Correlation of ASRS to the S&P 500 = .93

Risk Budgeting



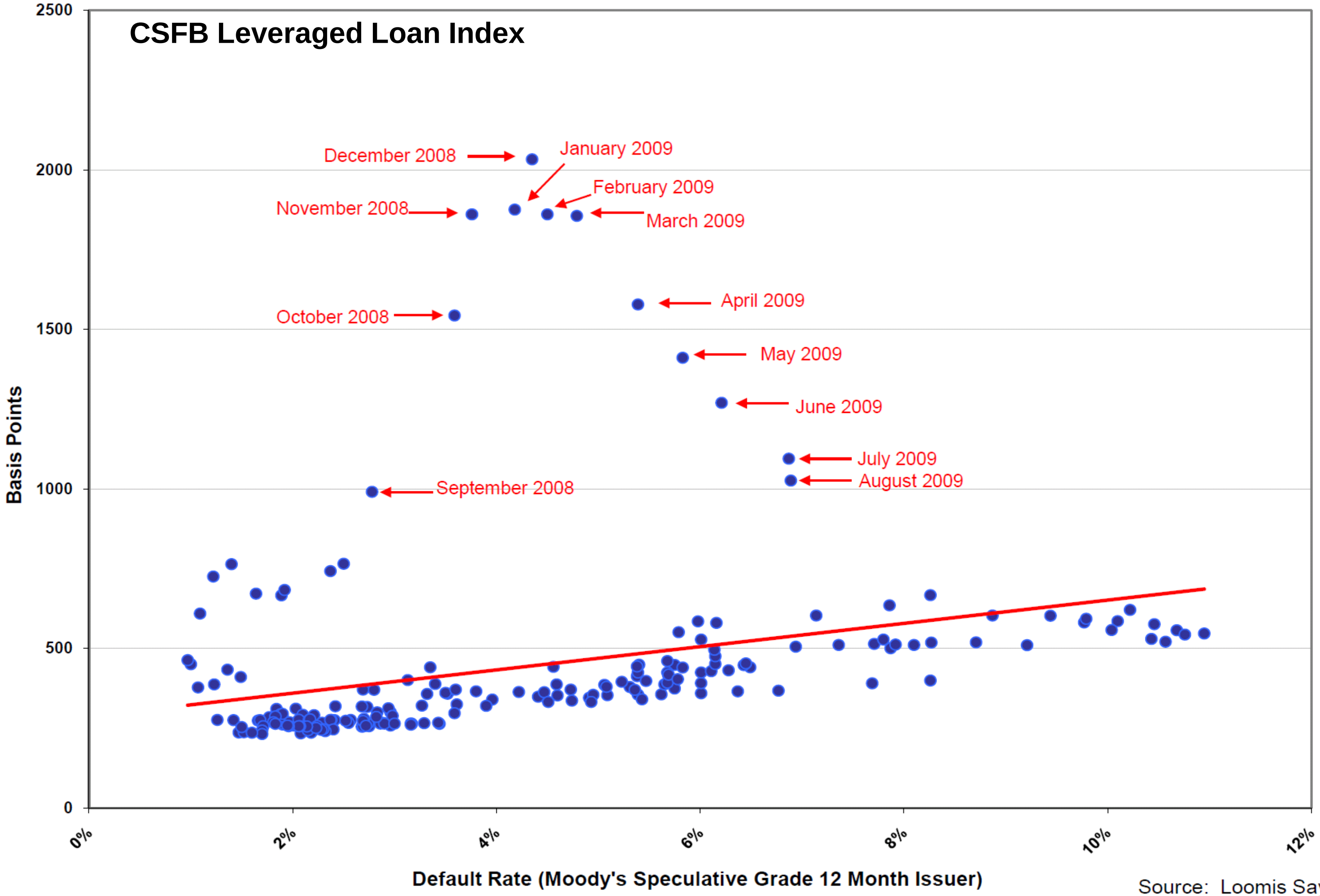
Summary & Takeaways

- ASRS public equity target accounts for ~87% of total expected portfolio volatility
  - Reduce public equity exposure to lower overall portfolio volatility
  - Opportunities in high yield fixed income and other credit markets currently provide equity like returns with less volatility
- Diversify within Domestic and Non-U.S. Equities
  - Active vs. Passive
    - More passive allocations to domestic and non-U.S. large cap equities
    - More active allocations in Non-U.S. small cap and emerging market equities
  - Add dedicated Emerging Markets Equity allocation
    - Eliminate MSCI ACWI ex-U.S. benchmark for non-U.S. equities in favor of dedicated benchmarks
    - MSCI EAFE (Int'l Developed Markets) and MSCI Emerging Markets
  - Explore tactical allocation to International Small Cap rather than strategic allocation
    - Allow international large cap managers to tactically allocate into small cap space

Fixed Income Investment Outlook

- A variety of fixed income sectors are currently offering attractive risk-adjusted return potential
  - ABS/RMBS/CMBS
  - High Yield Bonds
  - Bank Debt
- Spreads have come in over the past several months
  - Relative attractiveness of these opportunities can change quite quickly
  - While spreads have come in, we believe the economic recovery will be slow and volatile, and opportunities will continue to present themselves as credit spreads normalize
- Default rates, both consumer and corporate, are expected to rise
  - Current yield spreads are pricing in and compensating investors for these expected default rates
  - As defaults increase, opportunities in distressed debt will be available

Bank Loans: Spreads Still Wide, Defaults Ticking Up



Source: Loomis Sayles

Summary & Takeaways

- Current spreads and volatility in credit markets provide the potential for attractive risk-adjusted returns
- The Fund's active fixed income managers are underperforming the index
  - Core Plus managers have the ability to take on more risk than the index with the expectation of higher returns
    - Consolidate Core Plus and Core fixed income managers into one/two Core portfolio(s)
    - Allow niche managers to take advantage of opportunities in below investment grade and spread sectors
- Add allocation to below investment grade asset classes
  - Dedicated high yield managers vs. tactical, opportunistic multi-sector managers
  - Put the tactical decision in the hands of the manager(s)
  - Funding and implementation to be determined by ASRS Staff and Consultants
- Expand Opportunistic allocation
  - Allows the Fund to take further advantage of distressed credit markets as opportunities present themselves
  - Look at managers with lock-ups to prevent forced selling due to investor fears
- Maintain a nimble focus, implementing tactical views with passive vehicles, including BGI modules and internally managed F2 portfolio

Inflation Linked Assets

- Inflation Linked Assets are defined as investments that demonstrate a short-term positive correlation with U.S. inflation. These include:
  - Commodities
  - TIPS
    - Commodities and TIPS have displayed short-term positive correlation with U.S. inflation
  - Infrastructure, Timber, and Real Estate will likely only provide inflation protection in the intermediate to long-term
- Diversification Benefits – Inflation Linked Assets have low correlations…
  - To traditional asset classes and are counter-cyclical (rise when many others fall);
  - Among one another; and
  - Which lowers overall portfolio volatility, providing higher risk-adjusted return
- Create a strategic allocation to commodities
- Gain periodic exposure to TIPS through actively managed external fixed income portfolios, GTAA mandates, and/or a separately managed internal portfolio
- Given the very different risk/return characteristics of the asset classes within Inflation Linked Assets, specific benchmarks will be developed for each underlying asset class (e.g. DJ-UBS Commodity Index for Commodities) as opposed to a broad return objective (CPI + X%)

Opportunistic Investments

- Opportunistic Investments are defined as:
  - Being tactical in nature. That is, they should capitalize on temporary opportunities created by market conditions/dislocations **AND**…
  - Be outside of the Total Fund Benchmark or;
  - If within in the Total Fund Benchmark, the strategy will be absolute return oriented

- Expand Range for Opportunistic Allocation to 0 – 10% to take advantage of continuing changes in market conditions

Risk Parity

- Risk Parity strategies allocate risk across diverse beta exposures that in aggregate exhibit low correlations to any particular asset class or economic environment
  - Portfolio construction is based on allocating risk instead of capital
    - Typical 60% equity allocation is a "one bet" portfolio taking 90% of the risk budget
  - Attempt to equalize the contribution to total portfolio risk from many asset classes
  - Reduced dependence on equity risk concentration for target returns
    - Risk Parity strategies have less exposure to equity market drawdowns by reducing dominance of equity risk in total portfolio volatility
  - Leverage is often employed to generate an attractive return, meaning notional exposure is higher than 100%
- Risk Parity strategies introduce potential issues to be considered:
  - Leverage is required
  - Counterparty risk may exist
  - Transparency may prove challenging
  - Limited number of mandates to choose from
  - Limited ability to specify constraints
- Create a strategic target policy allocation of 0%, with a range of 0 – 5%
- Over the coming quarters, information and analysis of available and possible prospective managers' risk parity strategies will be introduced for discussion and consideration

Absolute Return

- Absolute return is a term that comes from the skill-based nature of the industry and are returns derived from the manager's skill at security selection, independent of the market.
- Absolute return strategies are *"alpha"* dominated strategies whose return patterns are independent or less correlated to traditional asset classes (i.e. equity and fixed income).
- Absolute return strategies usually have low correlation and low volatility with equity and fixed income.
- The *alpha* in absolute return strategies is not constant; it changes in different market environments (almost all alpha sources contain some embedded beta).
- Absolute return strategies are not benchmark constrained, and they may use several degrees of freedom: shorting, leverage, derivatives with non-linear payoffs, and unconstrained investment universes.
- Maintain strategic target allocation range of 0 – 5%.

ASRS Asset Allocation Comparison

	Current Actual ASRS Asset Allocation[1]	Current ASRS Asset Allocation Policy Target	Range	% Passive	Benchmark	Recommended ASRS Asset Allocation Policy Target	Range	% Passive	Benchmark
Public Equity	**69%**	**63%**				**58%**			
Domestic Equities	52%	45%	35 - 55%			40%	30 - 50%		
Large Cap	*35%*	*31%*	*25 - 37%*	*65 +/- 10%*	*S&P 500*	*28%*	--	*75 +/- 20%*	*S&P 500*
Mid Cap	*9%*	*7%*	*5 - 9%*	*45 +/- 20%*	*S&P 400*	*6%*	--	*45 +/- 20%*	*S&P 400*
Small Cap	*8%*	*7%*	*5 - 9%*	*30 +/- 20%*	*S&P 600*	*6%*	--	*30 +/- 20%*	*S&P 600*
Non U.S. Equities	17%	18%	8 - 28%			18%	8 - 28%		
Int'l Developed Large Cap	*15%*	*18%*	*8 - 28%*	*10 +/- 5%*	*MSCI ACWI ex.U.S.*	*13%*	--	*50 +/- 20%*	*MSCI EAFE*
Int'l Developed Small Cap	*2%*	*0%*	*N/A*	*N/A*	*N/A*	*2%*	--	*20 +/- 20%*	*MSCI EAFE Small Cap*
Emerging Markets	*0%*	*0%*	*N/A*	*N/A*	*N/A*	*3%*	--	*20 +/- 20%*	*MSCI Emg Mkts*
Public Fixed Income	**26%**	**26%**	**16 - 36%**			**26%**	**16 - 36%**		
Core or Core Plus	*26%*	*26%*	*16 - 36%*	*55 +/- 20%*	*Barclays Capital Aggegate*	*24%*	--	*55 +/- 20%*	*Barclays Capital Aggregate*
High Yield	*0%*	*0%*	*N/A*	*N/A*	*N/A*	*2%*	--	*20 +/- 20%*	*Barclays Capital High Yield*
Private Equity	**1%**	**5%**	**3 - 7%**	**N/A**	**Russell 3000 + 3%**	**7%**	**5 - 9%**	**N/A**	**Russell 3000 + 3%**
Real Estate	**3%**	**6%**	**4 - 8%**	**N/A**	**NCREIF + 1%**	**6%**	**4 - 8%**	**N/A**	**NCREIF + 1%**
Inflation Linked Assets	**0%**	**0%**	**N/A**	**N/A**	**N/A**	**3%**	**0 - 5%**	**N/A**	**TBD**
Risk Parity	**0%**	**0%**	**N/A**	**N/A**	**N/A**	**0%**	**0 - 5%**	**N/A**	**TBD**
Absolute Return	**0%**	**0%**	**0 - 5%**	**N/A**	**N/A**	**0%**	**0 - 5%**	**N/A**	**TBD**
Opportunistic	**1%**	**0%**	**0 - 5%**	**N/A**	**TBD**	**0%**	**0 - 10%**	**N/A**	**TBD**
Expected Return	**--**	**9.1%**				**9.3%**			
Standard Deviation	**--**	**14.4%**				**14.0%**			
Sharpe Ratio	**--**	**0.49**				**0.51**			
Sortino Ratio (0% Minimum Acceptable Return)	**--**	**0.80**				**0.85**			
Probability of < 0% over 1 year	**--**	**25.08%**				**24.05%**			
Probability of < 0% over 5 years	**--**	**6.65%**				**5.76%**			

[1]as of September 21, 2009

Note: Return and volatility expectations based on NEPC's 5-7 year capital market assumptions.

Recommended ASRS Asset Allocation Policy Schematic (Exhibit A)

Asset Class	Target	Range	Benchmark	Passive
PUBLIC EQUITY				
Large Cap	28%		S&P 500	75 +/- 20%
Mid Cap	6%		S&P 400	45 +/- 20%
Small Cap	6%		S&P 600	30 +/- 20%
US Equity	**40%**	**(30 - 50%)**		
Developed Large Cap	13%		MSCI EAFE	50 +/- 20%
Developed Small Cap	2%		MSCI EAFE Small Cap	20 +/- 20%
Emerging Markets	3%		MSCI Emg Mkts	20 +/- 20%
Non-US Equity	**18%**	**(8 - 28%)**		
FIXED INCOME				
Core	24%		Barclays Aggregate	55 +/- 20%
High Yield	2%		Barclays High Yield	20 +/- 20%
US Fixed Income	**26%**	**(16 - 36%)**		
PRIVATE EQUITY				
Private Equity	**7%**	**(5 - 9%)**	Russell 3000 + 3%	N/A
REAL ESTATE				
Real Estate	**6%**	**(4 - 8%)**	NCREIF + 1%	N/A
INFLATION LINKED ASSETS				
Commodities	**3%**	**(0 - 5%)**	TBD	N/A
TIPS	**0%**	**(0 - 5%)**	TBD	N/A
RISK PARITY				
Risk Parity	**0%**	**(0-5%)**	TBD	N/A
ABSOLUTE RETURN	**0%**	**(0 - 5%)**	TBD	N/A
OPPORTUNISTIC	**0%**	**(0 - 10%)**	TBD	N/A
TOTAL	**100%**			
GTAA	**10%**	(8-12%)	TF Benchmark	N/A
Expected Return	**9.33%**			
Standard Deviation	**14.02%**			
Sharpe Ratio	**0.51**			

*Risk Parity to be evaluated over the next 6 months

Total Fund Benchmark

28% S&P 500

6% S&P 400

6% S&P 600

13% MSCI EAFE

2% MSCI EAFE Small Cap

3% MSCI Emerging Markets

24% Barclays Capital Aggregate

2% Barclays Capital High Yield

7% Russell 3000 + 3%

6% NCREIF + 1%

3% TBD (Commodities)

Note: Indexes in bold are new to the Total Fund Benchmark

Pro Forma ASRS Asset Allocation

	Current AA Policy (A)	Proposed AA Policy (B)	Increase(decrease) (B-A)	Current Actual AA as of 10/12/09	Expectations of Actual AA After Fully Implementing Proposed AA Policy
U.S. Equities	45%	40%	-5%	51%	31%
Int'l Equities	18%	18%	0%	17%	18%
Total Equities	63%	58%		68%	49%
Fixed Income	26%	26%	0%	25%	26%
RE	6%	6%	0%	3%	6%
PE	5%	7%	2%	1%	7%
Inflation Linked**	0%	3%	3%	0%	4%
Absolute Return	0% (0-5)	0% (0-5)	0%	0% (0-5)	0% (0-5)
Opportunistic	0% (0-5)	0% (0-10)	0% (+5% range)	3% (0-5)	8% (0-10)
Totals	100%	100%		100%	100%

** Commodities 3% (0-5%)
TIPS 0% (0-5%)

Benchmark Definitions

- **MSCI EAFE (Europe, Australia, Far East) Index –** is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding the U.S. and Canada. As of June 2007, the MSCI EAFE Index consisted of the following 21 developed market country indices: Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland and the United Kingdom.

- **MSCI EAFE Small Cap Index –** is a free float-adjusted market capitalization index that is designed to measure the equity market performance of small capitalization securities in developed markets, excluding the U.S. and Canada. MSCI defines the small cap universe as all listed securities that have a market capitalization in the range of $200 M - $1,500 M USD.

- **MSCI Emerging Markets Index –** is a free float-adjusted market capitalization index that is designed to measure the equity market performance of emerging markets. As of June 2009, the MSCI Emerging Markets Index consisted of the following 22 emerging market country indices: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey.

- **Barclays Capital High Yield Index –** covers the universe of fixed rate, non-investment grade debt, including corporate and non-corporate sectors. Pay-in-kind (PIK) bonds, Eurobonds, and debt issues from countries designated as emerging markets are excluded, but Canadian and global bonds (SEC registered) of issuers in non-emerging market countries are included. Original issue zero coupon bonds, step-up coupon structures and 144-As are also included.

Note: These indices are new to the Total Fund Benchmark

Benchmark Definitions

- **S&P 500 Index –** is widely regarded as the best single gauge of the U.S. equities market. This index includes a representative sample of 500 leading companies in leading industries of the U.S. economy. Securities with a market capitalization of at least $3 Billion and a public float of at least 50% of its shares are eligible for inclusion. Although the S&P 500 Index focuses on the large-cap segment of the market, with approximately 75% coverage of U.S. equities, it is also an ideal proxy for the total market. The S&P 500 is also the U.S. component of the S&P Global 1200.

- **S&P 400 Index –** is representative of 400 stocks in the mid cap sector of the domestic stock markets, representing all major industries. Securities with a market capitalization between $750 Million and $3.3 Billion and a public float of at least 50% of its shares are eligible for inclusion.

- **S&P 600 Index –** is representative of 600 stocks in the small cap sector of the domestic stock markets, representing all major industries. Securities with a market capitalization between $200 Million and $1.0 Billion and a public float of at least 50% of its shares are eligible for inclusion.

- **Russell 3000 Index –** measures the performance of the 3,000 largest U.S. companies based on total market capitalization. This represents approximately 98% of the investable U.S. equity market.

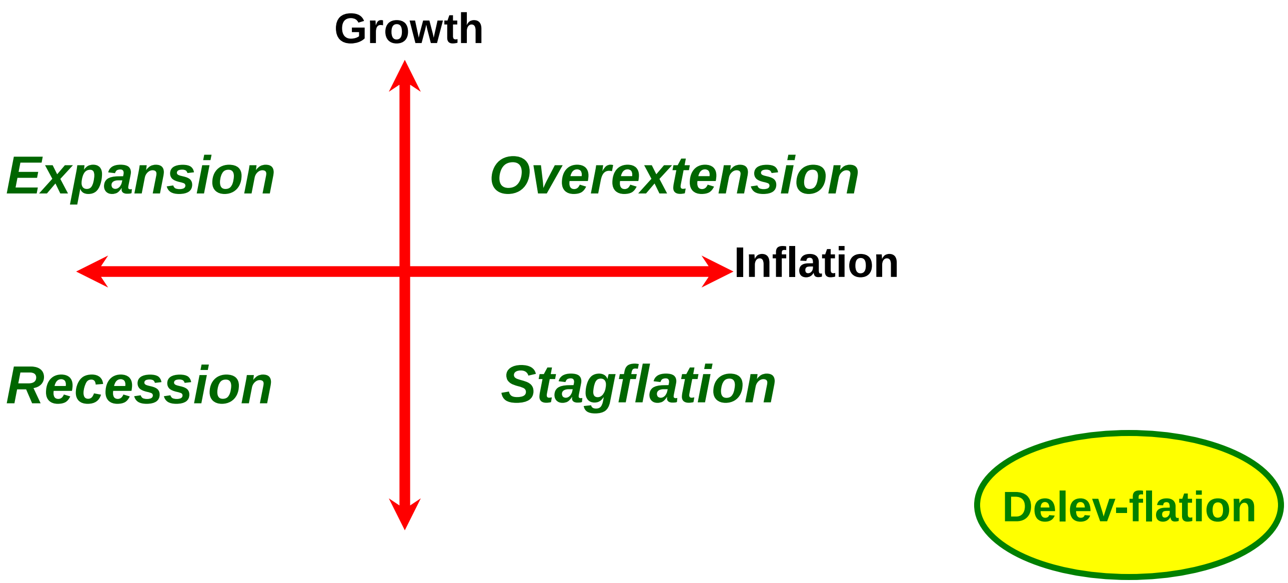
- **Barclays Capital U.S. Aggregate Bond Index –** represents fixed income securities that are SEC-registered, taxable and dollar denominated. The index covers the U.S. investment grade fixed rate bond market, with index components for government and corporate securities, mortgage pass-through securities, and asset-backed securities. The index includes securities that are rated investment-grade quality or better, have at least one year to maturity and have an outstanding par value of at least $250 Million.

- **NCREIF Property Index –** is a quarterly time series composite total rate of return measure of investment performance of a very large pool of individual commercial real estate properties acquired in the private market for investment purposed only. All properties in the NPI have been acquired, at least in part, on behalf of tax-exempt institutional investors – the great majority being pension funds. As such, all properties are held in a fiduciary environment. The NPI consists of both equity and leveraged properties, but the leveraged properties are reported on an unleveraged basis, making the index completed unleveraged. NCREIF requires that properties included in the NPI be valued at least quarterly, either internally or externally, using standard commercial real estate appraisal methodology. Each property must be independently appraised a minimum of once every three years.

Appendix

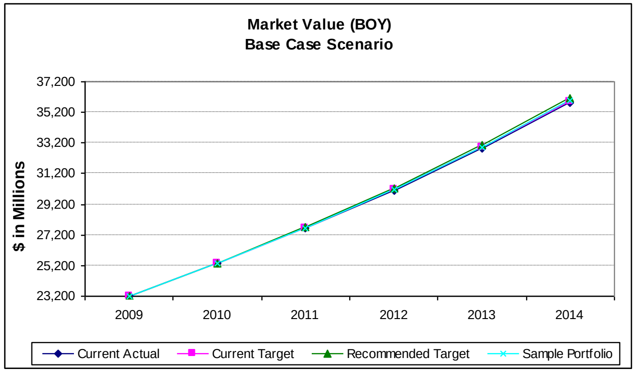
Scenario Analysis

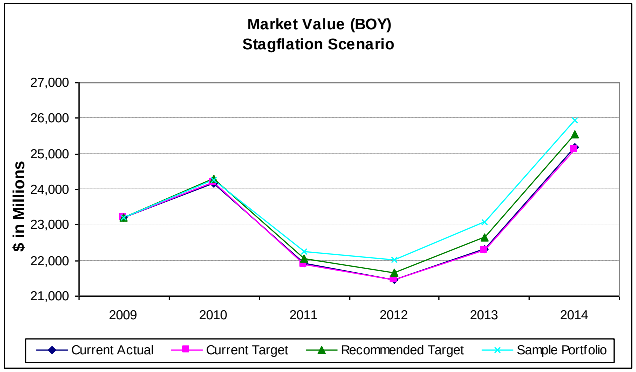
- NEPC Scenario Analysis allows plan sponsors to test the viability of alternative asset mixes under multiple economic scenarios
- Allows better understanding of risk exposures under contrasting inflation and economic growth regimes
- Can understand the effect on assets and liabilities (funded status)

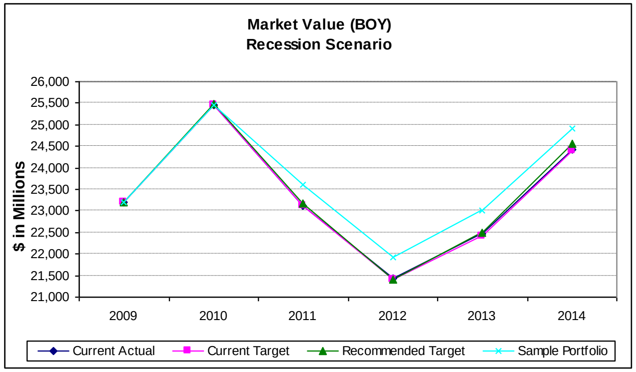


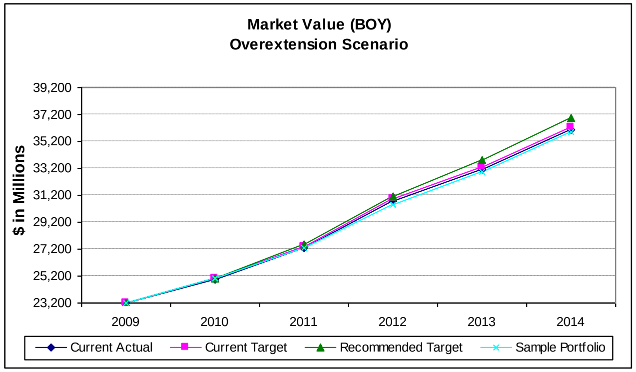
- Scenarios assume 2009 unfolds according to NEPC 5-7 year assumptions (appendix) followed by four year scenario and then a return to expectations

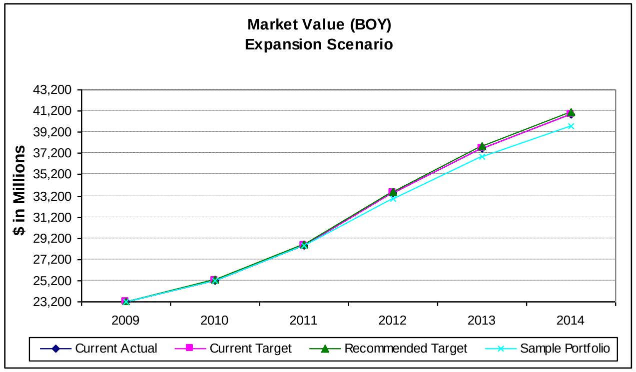
Scenario Analysis

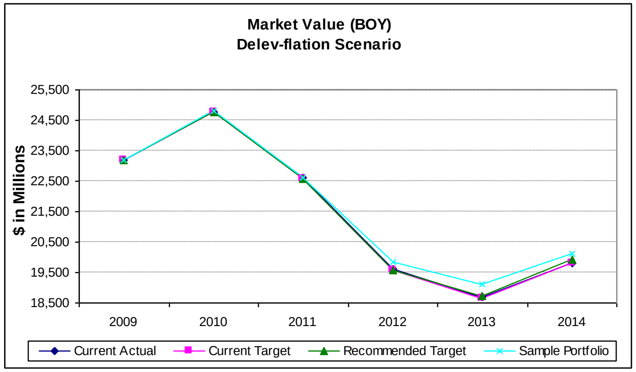












Note: Sample portfolio shown to show the effect of lowering the ASRS Total Fund's equity allocation further, by allocating funds to asset classes included in the ASRS Asset Allocation Policy.

2% to TIPS (0 – 5% Range), 2.5% to Risk Parity (0 – 5% Range), 5% to Opportunistic (0 – 10% Range), and 2.5% to Absolute Return (0 – 5% Range)

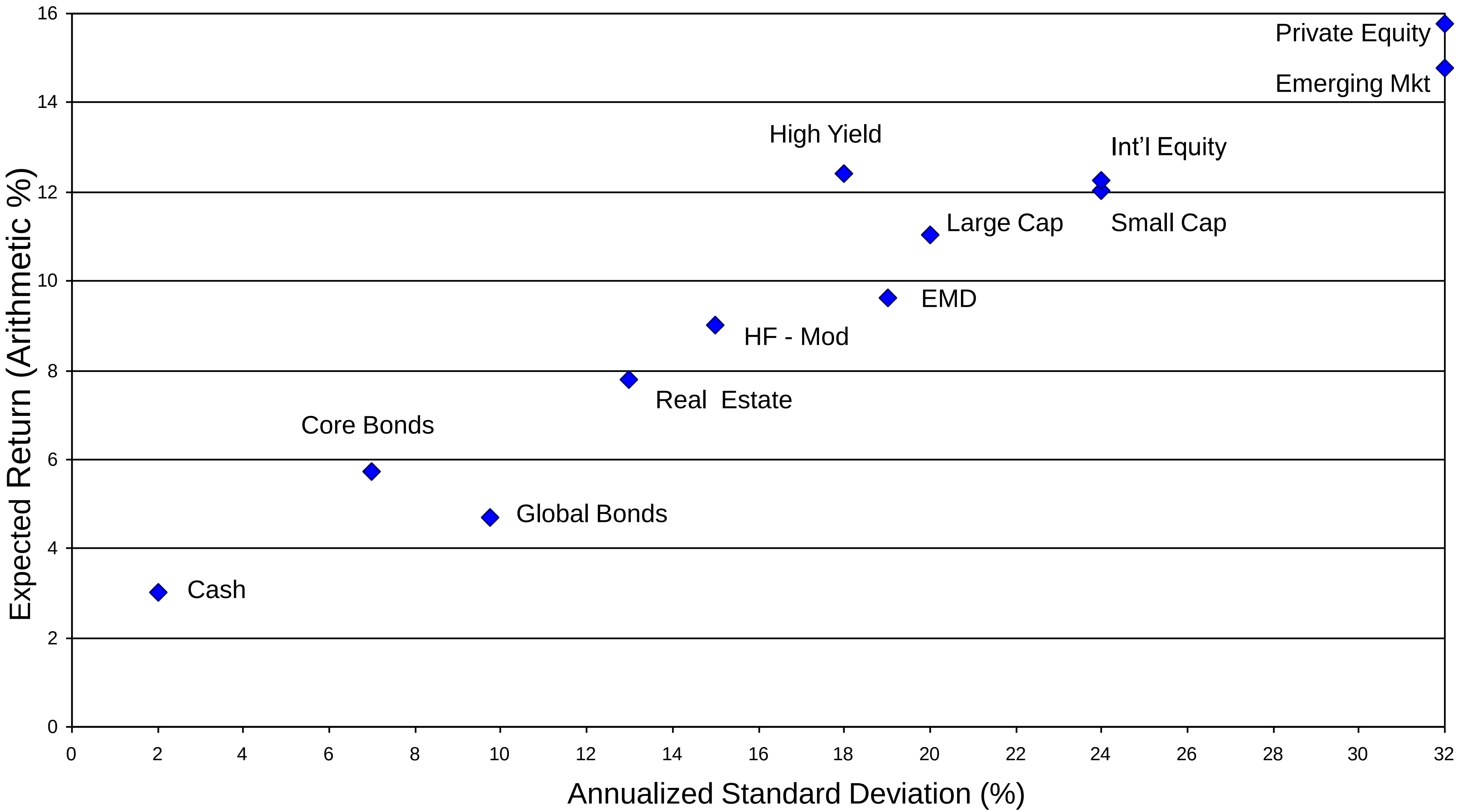
Background

- We assume a return to "normal" markets within the next 7 years
  - Normal will not mean the levels of liquidity and leverage in early 2007
- The timing of normalization is unclear, and will occur at different times for different markets, e.g., credit before equity before economic growth
  - However, recovery may not follow a typical pattern, just as many aspects of the recession have not been typical
  - Recent events will influence markets for years to come; investors will remember how bad things can get
- There is a small but credible risk of a long-term deflationary spiral such as Japan in the 1990s or the world in the 1930s
  - Long-term inflation is more likely; the Fed has taken many unprecedented actions that won't be as simple to reverse as interest rates
- Important to use risk budgeting and scenario analysis as a complement to mean-variance assumptions in times of extensive uncertainty

What is Normal?

- Functioning credit market
  - Banks lending to companies, individuals and each other
- Risk Premia
  - Investors paid incrementally more to assume incremental risk
- Capital Markets
  - Company fundamentals to drive returns
  - Winners and losers in each industry
- Expectations move towards more normal growth & inflation rates
  - Growth
    - Current US GDP Growth of -0.5% (3Q08) well below the 1970 – US GDP average growth of about 3%
  - Inflation
    - Inflation of 1.1% (Nov 2008) also well below historical average of about 4%

NEPC 2009 Capital Market Assumptions



2009 5 – 7 Year Return Forecasts

Geometric Expected Return			
Asset Class	**2008**	**2009**	**Change**
Inflation	3.00%	3.00%	0.00%
Cash	4.00%	3.00%	-1.00%
Core Bonds	5.00%	5.50%	0.50%
TIPs	4.75%	6.00%	1.25%
Long G/C Bonds	5.25%	6.00%	0.75%
High-Yield Bonds	6.75%	11.00%	4.25%
Global Bonds	4.00%	4.25%	0.25%
Emerg Market Debt	6.50%	8.00%	1.50%
Large Cap Equities	8.50%	9.25%	0.75%
Small/Mid Cap Equities	8.75%	9.50%	0.75%
Int'l Equities	9.00%	9.75%	0.75%
Emerg Market Equity	9.50%	10.50%	1.00%
Commodities	5.00%	5.25%	0.25%
Real Estate	6.75%	7.00%	0.25%
Private Equity	10.50%	11.50%	1.00%
Hedge Funds - Cons	6.50%	6.50%	0.00%
Hedge Funds - Mod	8.00%	8.00%	0.00%
Infrastructure	--	7.00%	--
Risk Parity	--	10.50%	--

Volatility			
Asset Class	**2008**	**2009**	**Change**
Inflation	1.50%	2.00%	0.50%
Cash	1.50%	2.00%	0.50%
Core Bonds	6.75%	7.00%	0.25%
TIPs	6.00%	7.50%	1.50%
Long G/C Bonds	11.00%	12.50%	1.50%
High-Yield Bonds	10.75%	18.00%	7.25%
Global Bonds	9.25%	9.75%	0.50%
Emerg Market Debt	15.00%	19.00%	4.00%
Large Cap Equities	16.00%	20.00%	4.00%
Small/Mid Cap Equities	21.00%	24.00%	3.00%
Int'l Equities	19.00%	24.00%	5.00%
Emerg Market Equity	27.00%	32.00%	5.00%
Commodities	15.00%	20.00%	5.00%
Real Estate	11.50%	13.00%	1.50%
Private Equity	27.00%	32.00%	5.00%
Hedge Funds - Cons	7.00%	8.00%	1.00%
Hedge Funds - Mod	10.00%	15.00%	5.00%
Infrastructure	--	12.00%	--
Risk Parity	--	17.70%	--

2009 Asset Class Correlation Forecasts

Asset Class	Cash	Core	TIPs	Long	HY	Global	EMD	Large	Smid	Intl	Emg	Comm	RE	PE	HF-C	HF-M	Infra	Risk Par
Cash	1.00																	
Core Bonds	0.25	1.00																
TIPs	0.10	0.75	1.00															
Long Bonds	0.20	0.95	0.75	1.00														
High-Yield Bonds	-0.10	0.50	0.30	0.55	1.00													
Global Bonds	0.15	0.70	0.50	0.60	0.30	1.00												
Emerg Mkt Bonds	0.00	0.10	0.10	0.00	0.60	-0.10	1.00											
Large Cap Equities	0.00	**0.25**	0.00	**0.25**	**0.60**	-0.10	0.50	1.00										
Small/Mid Cap Equit	-0.10	**0.05**	0.00	**0.15**	**0.70**	-0.20	0.50	0.90	1.00									
Int'l Equities	-0.20	**0.05**	0.00	**0.10**	**0.50**	0.30	0.50	0.70	0.60	1.00								
Emerg Int'l Equities	-0.10	**-0.15**	-0.10	**-0.25**	**0.55**	0.00	**0.70**	**0.55**	0.50	0.60	1.00							
Commodities	**0.00**	**0.00**	**0.30**	**0.00**	**-0.10**	**0.00**	**0.25**	**-0.10**	**-0.10**	**0.00**	**0.10**	1.00						
Real Estate	0.40	-0.10	-0.10	-0.20	-0.10	0.00	0.00	0.00	-0.05	0.10	-0.10	0.05	1.00					
Private Equity	-0.10	0.15	0.00	0.10	0.60	0.00	0.25	0.75	0.85	0.50	0.25	0.00	0.00	1.00				
Hedge Funds - Con	0.50	**0.40**	0.40	**0.40**	**0.35**	**0.10**	**0.10**	**0.30**	**0.30**	**0.15**	**0.10**	**0.05**	**0.00**	**0.20**	1.00			
Hedge Funds - Mod	0.10	**0.05**	0.10	**0.05**	**0.45**	**0.15**	**0.15**	0.50	0.50	0.15	**0.15**	0.00	**0.00**	0.30	0.90	1.00		
Infrastructure	0.20	0.50	0.70	0.90	0.50	0.70	0.10	0.10	0.10	-0.20	-0.10	0.25	0.50	-0.10	0.30	0.20	1.00	
Risk Parity	-0.10	0.70	0.75	0.65	0.55	0.75	0.30	0.30	0.20	0.55	0.00	0.30	-0.10	0.25	0.25	0.20	0.50	1.00

Major Asset Class Review (Geometric)

Asset Class	Historical Long Term Geometric Average[1]	5-to-7 Year NEPC Assumptions						
		2003	2004	2005	2006	2007	2008	2009
Inflation	3.0%	2.75%	2.75%	2.75%	3.00%	3.00%	3.00%	3.00%
Cash	3.7%	3.50%	3.50%	3.50%	3.75%	4.00%	4.00%	3.00%
Core Bonds[2]	8.4%	4.50%	4.50%	4.50%	5.00%	5.00%	5.00%	5.50%
Large Cap	9.6%	8.75%	8.50%	8.50%	8.50%	8.50%	8.50%	9.25%
International[3]	9.5%	9.75%	9.50%	9.50%	9.00%	8.75%	9.00%	9.75%

1. Reflects average since inception (1926 except as noted below) of the respective index through 11/30/2008.
2. LB/BC Aggregate reflects average compound annual return since 1976.
3. International reflects average annual return since 1970.

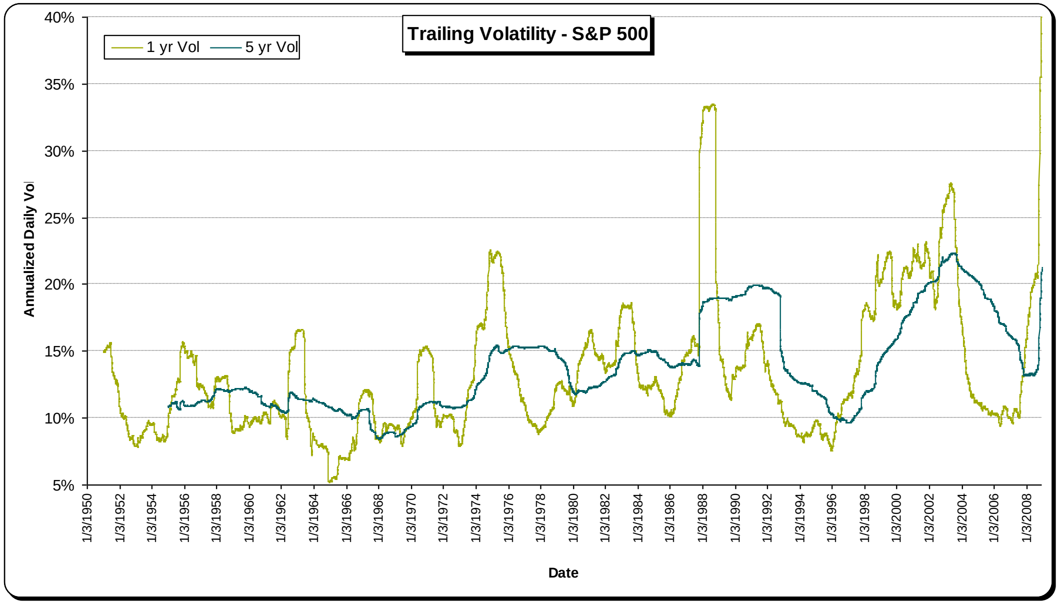
Assumption Development – Large Cap Equity

- Sources of Return
  - Valuation
  - Real earnings growth
  - Dividend yield
  - Inflation

Return Source	Estimates of Historical Averages (1937 - 2008)	Current Values	Expected Forecast Values	Return Contribution
Valuation	15.8	11.2	15.0	1.75%
Real Growth*	2.5%	-0.5%	2.0%	2.00%
Dividend Yield**	2.2%	2.5%	2.5%	2.50%
Inflation	3.8%	3.7%	3.00%	3.00%
			Total Expected Return	**9.25%**

* Real GDP growth used as proxy for real earnings per share growth

** Dividend yield history from 1988 – 2008



- Volatility
  - Historical annualized volatility = 15.8%
  - Trailing 12 month volatility (Dec 2008) = 41%
  - Current VIX Pricing ~ 44
  - Volatility is conditional – spikes in volatility tend to result in extend periods of increased volatility
  - Annual volatility expected to normalize over 5-7 years but this likely leads to 5-7 year volatility well above historical average
  - **2009 5-7 year Volatility assumption = 20%**

Equity Assumptions

- Large Cap Equity
  - Reflects return to normal markets over forecast horizon
  - Valuation adjustments expected to add to returns over 5-7 years
- Small Cap Equity
  - 25 basis point premium over large cap
  - Premium expected over 5-7 years, although large cap may outperform in the short term
  - Volatility expected to be higher than Large Cap
- International Developed Equity
  - 50 basis point premium over Large Cap US
  - Valuation adjustments expected to add to returns, with P-Es more depressed internationally than in US
  - Increased currency volatility expected to add to total volatility of asset class
- Emerging Market Equities
  - Valuation effects expected to contribute additional return following 60% drawdown in 2008
  - Long term secular decline of US Dollar expected to provide marginal additional return
  - Currency volatility expected to contribute to additional volatility

Assumption Development – Core Bonds

- Sources of Return
  - Yield
  - Changes in value
    - Yield adjustments (duration)
      - Includes spread compression/expansion and changes to Treasury yields
      - Current Spread on Credit Component = 5.75%
      - Current Treasury Yield = 2.0%
      - Spread compression offset by rising Treasury yields
    - Downgrades/defaults

Return Source	Current / Historical Values	Expected Forecast Values	Return Contribution
Yield	5.0%	5.0%	5.00%
Yield Adjustment	n/a	-1.0%	0.75%
Duration	4.0	4.0	
7 yr Default Rate	3.0%	3.0%	-0.25%
Recovery Rate		40%	
		Total Expected Return	**5.50%**

- Volatility
  - Factors leading to increased volatility
    - Higher rate of defaults and downgrades
    - Less issuance (more concentration)
  - 2009 volatility assumption = 7.00%

Assumption Development – High Yield

- Sources of Return
  - Yield – assumed asset class is based on BB-B
  - Changes in value
    - Yield adjustments (duration)
      - Includes spread compression/expansion and changes to Treasury yields
      - Current Spread on Credit Component = 18%   - Current Treasury Yield = 2%
      - Spread compression offset by rising Treasury yields
    - Downgrades/defaults
      - Defaults higher than historical and recoveries lower than historical given lighter covenants

Return Source	Current / Historical Values	Expected Forecast Values	Return Contribution
Yield	18.0%	15.0%	15.5%
Yield Adjustment	n/a	-3.0%	2.0%
Duration	4	4	
7 yr Default Rate	35%	50%	-6.50%
Recovery Rate	40%	30%	
		Total Expected Return	**11.00%**

- Volatility
  - Factors leading to increased volatility
    - Higher rate of defaults and downgrades, less access to credit for lower quality companies
    - Less issuance (more concentration)
  - 2009 volatility assumption = 18.00%

Fixed Income Assumptions

- Core Bonds
  - Current BC Aggregate yield = 5.0%
  - Spread compression in credit component over next 5-7 years expected to be somewhat offset by rising yields on Treasuries
  - Increase in defaults detracts marginally from total return on investment grade
- TIPS
  - Total return reflects inflation assumption + 2% real yield
  - Additional return reflects potential for real yield compression and demand increase vs. lack of issuance
- Long Bonds
  - 50 basis point return premium to intermediate bonds reflects normally sloped yield curve
  - Increased volatility due to credit uncertainty and reduced issuance
- High Yield
  - Current yield (High Yield = 18%) expected to fall over forecast horizon
  - Total return much lower than yield as defaults and lower than historical recovery rates due to lighter covenants lead to principal decay
  - Volatility expected to remain high for some time
- Global Bonds
  - Current global yield not reflective of managers portfolios, which have Japan underweight
  - Return reflects yield plus some US Dollar decline – expected to materialize in later years of forecast
- Emerging Market Debt
  - Current yield (10%) offset by downgrades and defaults – expected to be more modest than corporate high yield with improving emerging market fundamentals

Assumption Development - Commodities

- Commodities asset class – production weighted

- Sources of return
  - Inflation
  - Marginal production costs still passed to buyers
  - Pricing due to supply & demand

Return Source	Return Contribution
Inflation	3.00%
Production	1.75%
Pricing	0.25%
Total Expected Return	5.00%

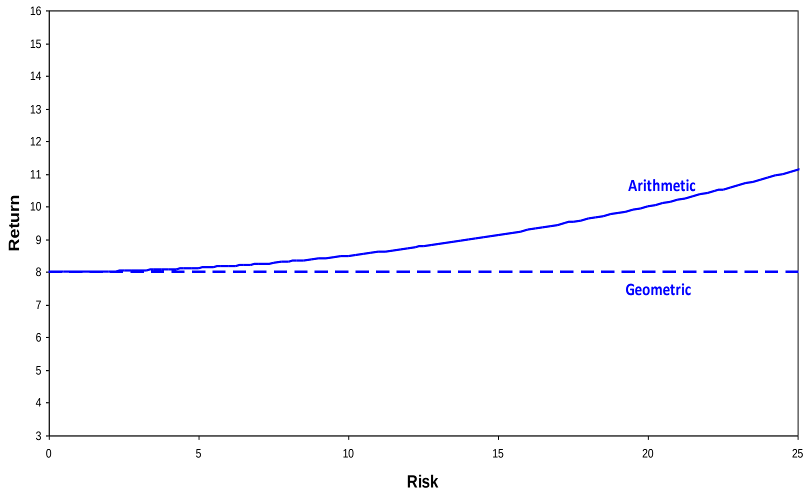
- Volatility increased to 20% to reflect short term demand and long term supply uncertainty as well as increasing inflation uncertainty
  - More in line with historical volatility of production weighted index

Alternative Assumptions

- Mean/variance framework can be used to show diversification benefits of alternatives, but is limited in ability to:
  - Size alternatives relative to traditional investments
  - Address distinctions of sub-categories or current manager strategies in the market
- Actual implementations should use Research teams to adjust to specific strategies
- Real Estate
  - Mix of fixed income, equity, and real asset components
- Hedge Funds – Conservative
  - Cash + 2.5%
- Hedge Funds – Moderate
  - Cash + 4%
- Private Equity
  - Extension of public equity market

Arithmetic versus Geometric Returns

- The arithmetic average and geometric average look at the same return series in different ways
- The goal is to use each appropriately
- Geometric returns are lower, based on "volatility drag" over time
- Conversely, the arithmetic return needed for a risky portfolio to meet a geometric target can be much higher



	Arithmetic	Geometric
Definition	Expected one-period return	Expected multi-period return, reflecting volatility drag on compound returns
Formula	Simple average of return series (r1+r2+…rn)/n	Inverse power of compound returns [(1+r1)(1+r2)…(1+rn)]^(1/n)-1
Uses	• CAPM and efficient frontier analysis • Building-block approach for expected return* • Manager return attribution and analysis	• Expected diversified portfolio return • Total portfolio return analysis

* Geometric returns should not be combined. Rather, combine arithmetic returns and the standard deviation, using correlations. This will create a portfolio standard deviation that reflects the benefits of diversification, and results in a higher expected portfolio geometric return than the weighted average geometric return.

Themes for Correlation Assumptions

- Difficult to use quantitative data in assessing future correlations
  - Long term history much different than last 1½ years
  - Even in normal markets, correlations vary greatly (see chart below)
- Increasing Credit/Equity correlations
  - Risky assets linked more closely as economy recovers
- Emerging Markets
  - Some minor correlation increases to reflect lack of decoupling
- Hedge Funds – Conservative
  - Recognition of inherent beta even in conservative strategies
- Commodities
  - Increasing slightly – still good diversification but not quite so negatively correlated